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ABSTRACT

Prompted by the growing interest in the role of reader-related and text-related variables in reading comprehension, a study compared 30 sixth grade students in regular classrooms to 30 language impaired students. The purpose was to assess the relationship of (1) text structure manipulations for simple and complex sentence structure, (2) discourse type for narrative and expository text (expository types of cause/effect, problem/solution, descriptive, list like, and compare/contrast), and (3) language ability to free and probed recall responses. Reader-related variables such as age, interest, decoding skills, background knowledge, and purpose were held constant, as were the text-related variables for both content and emphasis. Individual assessments were completed for measures of language ability and for free recall and probed student responses to a series of passages. The passages were constructed to allow for grammatically simple and grammatically complex versions of each of the discourse types. Materials included four pretests, and two sets of 12 passages with accompanying comprehension questions. Results revealed significant effects for structured discourse types and types of questions for both probed and free recall responses. Group differences were predicted by overall scores from the Porch Index of Communicative Ability in Children and the percentage of complex sentences used. The results supported the facilitating effect of structured text on recall. Four pages of references are appended. (HOD)

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THE RELATIONSHIP OF TEXT STRUCTURE MANIPULATIONS, DISCOURSE TYPE, AND LANGUAGE ABILITY ON QUESTION ANSWERS AND FREE RECALL RESPONSES IN LEARNING DISABLED CHILDREN

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ABSTRACT

THE RELATIONSHIP OF TEXT STRUCTURE MANIPULATIONS, DISCOURSE TYPE, AND LANGUAGE ABILITY ON QUESTION ANSWERS AND FREE RECALL RESPONSES IN LEARNING DISABLED CHILDREN

In recent years there has been a growing interest in the role of reader-related and text-related variables in reading comprehension. This study was designed to compare a homogenous group of Learning Disabled students to regular education age matched peers. The purpose of this study was to assess the relationship of text structure manipulations for simple and complex sentence structure, discourse type for narrative and expository text (expository types of cause effect, problem solution, descriptive, list like, and compare contrast) and language ability to free and probed recall responses.

Data for this study was collected by establishing subject control criteria for age, education, intelligence and decoding skills. Individual assessments were completed for 1) measures of language ability and 2) free recall and probed student responses to a series of passages. The passages were constructed to allow for a grammatically simple and a grammatically complex version of each of the discourse types.

A 2x6x2 multivariate analysis was completed on the data, with the between subject factors of group, and the within subject factors of discourse type and grammatical complexity, for both of the dependent measures of comprehension. A second multivariate analysis was completed to consider the added factor of type of question. The two groups were compared on language tests. An analysis of covariance was completed using the language measures each as a covariate to predict group differences.

The factor of group interracted with all of the other factors. Significant effects were found for structured discourse types, and types of questions for both probed and free recall responses. Group differences were predicted by the PICAC Overall scores and the percentage of complex sentences used. Results support the facilitating effect of structured text on recall.

THE RELATIONSHIP OF TEXT STRUCTURE MANIPULATIONS, DISCOURSE TYPE, AND LANGUAGE ABILITY ON QUESTION ANSWERS AND FREE RECALL RESPONSES IN LEARNING DISABLED CHILDREN

Reading comprehension is influenced by a variety of text-related and reader-related variables. Measures of comprehension must account for or control for a number of parameters, generally beyond the scope of a single research project. In the area of reader-related variables, age, interest, decoding skill, background knowledge, strategies for drawing inferences, schemata, perspectives, levels of agreement with content, purpose for reading, monitoring of comprehension levels, and reader processing styles will all influence reading comprehension (Meyer, 1981).

In the area of text-related variables, readers vary depending on the text content, structure and emphasis (or the author's format to convey purpose and mood through word choices and ordering of content). Text-related variables occur at all levels within and across sentences, as well as in longer units of discourse (Meyer, 1981).

It is important to consider both reader-related and text-related variables when studying the probable sources of comprehension breakdowns in Learning Disabled students. We know that Learning Disabled students are largely students who have trouble comprehending, yet the reasons for their difficulties have not been clearly delineated. Because the literature from studies of skilled readers indicates that there are potential problems with either reader-based or text-based variables, it is necessary to systematically examine the reader-related variables (such as background knowledge, linguistic competence, and intelligence) known to affect readers in general, and the text-variables (such as discourse type and grammatical structure) which seem to be likely causes of reading comprehension problems in the Learning Disabled students (Omanson,1985; Bock & Brewer, 1985).

Much information is available regarding the influence of text and reader variables on normal readers. Successful readers are able to understand text by their use of background knowledge (Marr & Gormely, 1982). They apply this knowledge to text information to build ongoing mental representations or schemata (Spiro, 1980; Goetz, 1979; Kintsch, 1974), and they engage in repair strategies when reading breakdowns occur (Brown, 1980; Paris & Lindauer, 1976), although the literature on comprehension monitoring suggests that comprehension failures can occur in the skilled readers as well (Brown, 1980; Flavell, 1981; Markman, 1981).

Linguistically based text analysis systems (Halliday & Hasan, 1976; Kintsch, 1974) have been used with skilled readers to measure the effect of grammatical cues in the text on comprehension. Although such studies were limited, due to their focus on sentence level processing as opposed to longer units of discourse, findings for normal readers did suggest little affect on comprehension when the grammatical format is altered. Text cohesive devices appear to be too general and too frequent in texts (Freebody & Anderson, 1981; Tierney & Mosenthal, 1981), and are not, therefore, related to text coherence.

Much of the research on affects on reading comprehension when texts are manipulated has involved narratives. Story grammar systems were devised to describe linguistically the rules for narrative structure. Freebody & Anderson (1981), reported that normal reader comprehension cannot be predicted by story grammar structures because the focus is on the relational structure created by the story statements rather than on the content. Text organization for higher level units has been shown to facilitate comprehension in normal readers (Wilhite, 1982). Subjects recall more high level than low level information when passage content is familiar (Graesser, 1978; Waters, 1978). Facilitating effects of passage types have been reported (Vande Kopple, 1982; Meyer, 1977).

Both text and reader variables have been found to influence comprehension in unskilled readers. In addition to decoding difficulties, unskilled readers may not have the available schemata, or lack knowledge and vocabulary to interpret the text (Spiro, Bruce & Brewer, 1980; Adams, 1980). There is a need for studies with unskilled readers that control for the range of differences between unskilled readers by defining their population according to language, intelligence levels, and decoding skills. Although few such studies exist, of those available, unskilled readers have been reported to have difficulty using knowledge structures in semantic memory to understand and integrate a particular text (Anderson, Reynolds, Shallert, & Goetz, 1977; Pearson, Hansen & Gordon, 1979; Raphael et al, 1980; Prichart & Anderson, 1977). Studies in listening comprehension have predicted the fund of general information of readers by their responses to comprehension questions (Humphreys & Davey, 1983). Unskilled readers have also been reported to be limited in their use of metacognitive strategies. Raphael et al. (1980) reported that poor readers had greater difficulty, when compared to skilled readers, judging passage difficulty and predicting performance level on a comprehension test. Poor readers have been found to use correct monitoring less frequently, to use fewer strategies for monitoring, and to be less aware of negative influences of lack of strategies on their reading comprehension (Paris & Meyers, 1981). Poor comprehenders have been reported to show less awareness of the meaningful aspects of text (Canney & Winograd, 1979). Reading comprehension problems may, therefore, be reflecting a failure to monitor with resultant attempts to repair by attending to triggering events or alerts to comprehension failures.

Information on reading comprehension in the less skilled reader is not, however, confined to reader input in text processing. There are additionally aspects of the text that aid the reader in predicting and processing content.

Information from the limited number of studies completed suggests that text variables may be a crucial area of exploration for comprehension breakdowns in unskilled readers, in addition to their obvious decoding deficits. Bock and Brewer (1985) reported that discourse comprehension may depend on coreference among the sentences of the text resulting in a single integrated mental model. Construction of such mental models would be more difficult for expository text than for narratives because expository text structures use more abstract ideas (Brewer, 1980). Bock and Brewer have reported that less skilled comprehenders have difficulty integrating ideas across sentences to construct text representations.

Unlike normal readers, unskilled readers have been found to vary in their comprehension of texts with grammatical manipulations (Cromer & Wiener, 1966; Guthrie, 1973). Specific grammatical structures have been shown to be difficult for poor readers, such as anaphoric references, or the use of pronouns referring back to the previously stated noun phrase (Frederiksen, 1982). At the text level, causal relationships are expressed through linguistic connectives. Use of linguistic structures marking logical relations among propositions or sentences increases with language development (Belin & Lust, 1975; and Paris, 1978). It is likely, therefore, that children who are delayed in the acquisition of syntactic skills may not be able to understand sentences in texts that express causal relationships through linguistic connectives. Although few studies have focused on the relationship between syntactic skills and poor comprehension, many studies report syntactic deficiencies in poor decoders (Vellutino et al, 1980; Vogel, 1974; deHirsch et al, 1966; Goldsmith, 1977; and Menyuk, 1979).

An exploration of the syntactic skills for children who do decode text, but who fail to comprehend it, is suggested because the syntactic ties reported to tie idea units together in text are developed late in the course of language acquisition. Fodor et al (1974), discussed the role of the clause boundary in sentence processing. They reported that as adult listeners hear a sentence they integrate phonetic and lexical information about the input with syntactic and semantic hypotheses about sentence structure and meaning. Information processed at the clause boundary then incorporates complete major syntactic and semantic units (Marslen-Wilson, Tyler & Seidenberg, 1972). Meyer, Brandt and Bluth (1980) found unskilled readers unable to identify with the author's organization structure to facilitate recall of text.

This study was designed to assess the relationships among discourse type, grammatical form, and language ability as they affect the ability of Learning Disabled students to answer questions and recall text read. In this study, a homogenous group of Learning Disabled children was compared to a group of Regular Education age matched peers. Reader-related variables such as age, interest, decoding skills, background knowledge, and purpose were held constant, as were the text-related variables for both content and emphasis. Text-related variables for structure for both grammatical form and discourse type differences in content presentation were manipulated. Comprehension was assessed according to how it varied as a function of discourse type and grammatical complexity. This variation was examined under two differing conditions of free recall and probed recall. The research questions to be answered in this study were the following: 1) How do Learning Disabled students differ from normally-achieving peers in their comprehension of text varying in (a) discourse type? (b) grammatical complexity? 2) How do Learning Disabled students differ from normally-achieving peers in their use of forms of linguistic complexity?

METHOD

Subjects:

Sixty students participated in the study, thirty sixth grade students in regular education classrooms, and thirty age matched language impaired students. Because it was necessary to control for differences in language, intelligence and decoding to establish a homogenous group of language impaired students, a strict admission criteria was established for those students. Students included in the study demonstrated normal intelligence, adequate decoding skills, and reading comprehension problems. All students in a large metropolitian school district who met these criteria were included as possible candidates for the language impaired group used in this study. Because the language impaired students selected overlapped with the clinically diagnosed group of Learning Disabled, that label will be used to refer to this subgroup of children with learning problems. All such students met the following criteria: a 1973 birthdate and corresponding sixth grade membership, scores on Psychological testing with the Weschler Intelligence Scale for Children Revised version (WISC-R) for Verbal and/or Performance scales within the normal range (as defined by total subtest scaled scores above 85); a 90% accuracy level in decoding for a grade level reading paragraph and word list scored according to the multidimensional PICAC scoring system; and reading comprehension scores on a grade level paragraph at the frustration level. These Learning Disabled children were matched by age, sex, race and socioeconomic status to normal sixth grade students, who were further tested to ensure that they were able to score within the normal range (above the fifteenth percentile in all modalities) on the Porch Index of Communicative Ability in Children (PICAC), that they were able to score at or above the 90th percentile on the two decoding measures, and that their paragraph comprehension score was at the independent level.

Materials:

Materials used in the study included four pretests, and two sets of twelve passages, or a total of twenty-four, with accompanying comprehension questions. A variety of test measures were used as pretests to delineate student levels of functioning in the areas of language and grammatical proficiency. The test measures were as follows: Porch Index of Communicative Ability in Children (PICAC), with Overall, Auditory and Verbal modality scores used, and the Story Reformulation Test, for the number and percentage of complex sentence structures used.

Twenty four passages were developed for use in this study, selected according to the following format: All passages were initially taken from fifth grade science, social studies and English literature textbooks, from several different series, to establish consistency in experience with topics, similarity of content, and use of topics considered to be of uniform interest and difficulty levels for fifth graders. The passages were chosen to represent either a narrative or one of Meyer's (1975) types of expository text structure (adversative, covariance, response, attributive, and descriptive). Two passages on similar content were selected for each discourse type. Passages were rewritten until uniformity was established for approximate length, number of propositions, clarity of writing style and consistency in representing the different discourse types. Passages ranged from 400-500 words in length and from 39-56 propositions.

Following the selection and preliminary construction of the passages, each passage was rewritten to provide for a grammatically simple and a grammatically complex version for each of the twelve passages. This allowed every child to read a simple and a complex passage of each discourse type. The syntax changes were written according to the guidelines describing levels of grammatical complexity for discourse in the van Dijk and Kintsch

(1983) system. This system describes relationships among propositions according to surface structure signals. The two text types did not vary in the order of presentation of content or in vocabulary. They did vary in their use of clausal structure to link ideas grammatically. One set of twelve passages was written so that all sentences conveyed either indirect coherence where facts temporarily and or conditionally related were denoted by separate sentences, linearly ordered. The relationship was expressed only one way (i.e. by sentence adverbials such as "therefore", "then", "so", etc.). The second set of passages were written so that all sentences reflected a coordinated connection (presented as a unit by compound sentences in addition to explicit coordinating connectives), a subordinate connection (to give facts in hierarchical ordering where complex sentences and embedded clauses were used to show conditional relationships), an integration (where one fact determined some aspect of the other fact such as a manner of action or property by use of relative clauses) or a reduction (where one fact was presented as a modifier through adjectivization).

A final analysis was completed on the passages to establish that all passages met guidelines at the sixth grade level according to the Fry (1968) Readability Formula, which was used to ensure a final measure of parallel passage complexity at the word length and sentence length level. Although these were initially fifth grade passages, they actually were across grade levels (from the third to the ninth), so uniformity was established by re-writing them to meet the Fry criteria at the sixth grade level. Since the readability formulas are based on the numbers of words and/or syllables in sentences, differences in sentence length caused the simple passages to be uniformly rated at a lower grade level, although the content remained the same.

A group of three university faculty members in the field of reading and reading comprehension reviewed all of the passages and unanimously agreed that all passages were of parallel content, familiarity, and difficulty levels, and that they reflected clear examples of the discourse types according to Meyer's (1975) descriptions.

A group of three university faculty members in the field of reading, a classroom teacher, and a speech and language pathologist evaluted the sentence structures in each of the passages, and unanimously agreed that grammatical changes were made according to the van Dijk and Kintsch (1983) system.

A pool of twelve questions were constructed for each of the twelve passage types according to Pearson and Johnson's (1978) criteria for textually explicit, textually implicit, and scriptally implicit question types. For each of the twelve passages, the twelve questions used information considered to be related to higher level ideas in the passage structures. Three faculty members in the area of reading were used to review the questions for agreement on question types. Two questions for each type, for all passages were chosen.

Procedures:

Formal approval of the research project was obtained from the Michigan State University Committee on Research Involving Human Subjects (UCRIHS), to ensure that the rights of the subjects used in the study were not violated. Following receipt of permission from the parents, student files were checked to establish criteria for intelligence and decoding skills. Students were tested individually. Testing was first completed for decoding and comprehension skills to establish candidacy for the study. The passage comprehension tests were completed following the language pretests. The passages were grouped into two sets, A and B, by grammatical form. Each set had a simple and a complex passage from each of the six discourse types. Half of the students

were given set A and half were given set B with the passages presented in one of four random orders to ensure that the Regular Education students received the same passage set and order as their matched Learning Disabled peer. Stduents were asked to read the passages, give them to the researcher, and complete three long addition problems. After completing the math problems, the students were asked to tell everything they remembered from the passage. Following their recall, they were asked to answer orally the six comprehension questions that were presented in random order across the passages. Students were asked, following all the testing, to read random segments of two percent of the sentences from the passages to be sure that they were able to decode the text.

Dependent Measures:

Pretests: Pretests were scored according to task-specific criteria. The Porch Index of Communicative Ability in Children (PICAC) was administered and scored according to the sixteen point scoring system outlined in the test manual. The examiner was certified in the administration and scoring of this test instrument.

The Story Reformulation Test was scored in two ways. A score was first established for the number of propositions recalled correctly, and a second score was established for a percentage of complex sentences used when compared to the total number of sentences.

The Analytical Reading Inventory paragraph was used for both decoding and comprehension, for subject selection purposes. For decoding, a mean score was computed using Porch's (1967, 1974) scoring system adapted by the author and this examiner to measure decoding fluency. Table 1 outlines the scoring system as applied to the decoding paragraph. The same scoring system was used

Table 1 PICAC SCORING SYSTEM CATEGORIES FOR DECODING

Score	Category	Dimensional Characteristics	Decoding
16	Complex	Accurate, responsive, complex, prompt, efficient	Not used
15	Complete	Accurate, responsive, complete, prompt efficient	Correct
14	Distorted	Accurate, responsive, complete or complex prompt, distorted	Syllable Stress
13	Complete Delayed	Accurate, responsive, complete or complex delayed	Delayed or Repeated
12	Incomplete	Accurate, responsive, incomplete, prompt	Change in a function word, verb tense or suffix
11	Incomplete Delayed	Accurate, responsive, incompleted delayed	Same as above but delayed
10	Corrected	Accurate, self corrected	Self corrected
9	Repeated	Accurate after instructions are repeated	Not used
8	Cued	Accurate after a cue is given	Not used
7	Related	Inaccurate, almost accurate	Semantic or Phonetic Miscue
6	Error	Inaccurate attempt at the task	Error word
5	Intelligible	Comprehensible but not an attempt at task	Rejection
4	Unintelligible	Incomprehensible but differentiated	Unintelligible
3	Minimal	Incomprehensible and undifferentiated	Not Used
2	Attention	No response but subject attends to task	Omissions
1	No Response	No response, no awareness of the task	Not Used

to establish a mean test score for decoding words presented without the benefit of sentence contexts. The questions accompanying the Analytical Reading Inventory paragraph were used to measure comprehension according to author criteria.

Free Recall:

Free recall responses were scored using Gordon and Pearson's (1983) weighted scoring system. This allowed for no, partial, and full credit. An additional category of credit was added to differentiate between ideas high and low in the passage structure. The top level ideas were given more weight in the revised scoring system.

Question Answers:

Question answers were scored according to Gray's (1959) criteria for full credit, one-half credit or no credit.

Interrater agreement was established for consistency in scoring both the free recall and the question answer responses. Two raters were used in addition to the researcher, a speech-language pathologist and a clinical psychologist. The two raters reviewed the criteria for scoring and independently scored ten percent of the data, which was selected on a random basis. Combined scores for the questions and recall responses were computed for each rater, for each passage. Resultant correlation coefficients were rho .97, .98 and .94, indicating a high level of agreement for interrater reliability.

RESULTS

Four analyses were conducted with both groups of students. The first data set measured and defined the language, decoding and syntactic skills in both

populations. The second data set repeated the group comparisons on comprehension scores but used the pretests each as a covariate to measure its effect on group differences. The third analysis examined the effects of discourse type and grammatical form on free recall and probed recall responses. Factors included the between subject differences of group (Learning Disabled or Regular Education students), and the within subject variables of discourse type (narrative, problem solution, cause effect, descriptive, list like, and compare contrast), and grammatical form (simple or complex). Finally a fourth analysis used the factors of group, discourse type, and the added factor of question type, in a second multivariate analysis.

To measure the language, syntactic skills, and to describe characteristics of the two groups, the test scores from the Porch Index of Communicative Ability in Children (PICAC), for Overall, Verbal and Auditory modality scores, and the Story Reformulation Test scores for the number of complex sentences and the percentage of complex sentences were used. These scores were analyzed to compare group differences. Table 2 presents group means for each of these measures. Significant differences were found ($p < .001$), between the two groups on all of the pretest measures. Students in the Regular Education group performed at a higher level than did those in the Learning Disabled group.

TABLE 2. MEAN SCORES FOR GROUP RESPONSES ON THE PRETESTS

Factor	Comparison of Ability	
Pretest	Learning Disabled	Regular Education
PICAC Overall	12.79	14.00 ***
PICAC Verbal	12.92	13.92 ***
PICAC Auditory	13.77	14.69 ***
Story Ref. % Complex S.	14.27	53.37 ***
Story Ref. # Complex S.	2.70	6.57 ***

*** p .001

To examine the relative importance of each of the factors for predicting success in comprehension, a second set of analyses were performed comparing comprehension performance levels using these scores as covariates. The second analysis was conducted to explore further the extent to which differences on the pretest measures would influence results on comprehension testing. If group differences were no longer present, such findings would indicate a possible relationship between the skill measured by the pretest(s) involved and the performance on the comprehension measures.

The Analysis of Covariance was conducted on the total comprehension score. This score was calculated from combining the recall and question response data. The significant factors from the first analysis served as the covariates entered individually to avoid overlap since performance on each was related. In this measure the group scores were the pretests, entered first, followed by the evaluation of the effect for group differences after the covariate was accounted for. Because group differences were predicted by the PICAC Overall scores and the Story Reformulation percentage of complex sentences used, but not the other pretests, to determine if these differences were also present in results for recall and question measures, the Analysis of Covariance was repeated for both. Results were consistent with the previous analysis, with the differences in performance present for the recall scores but not with question answers. Tables 3 and 4 give these results for the recall and the questions answer analyses.

TABLE 3 . ANCOVA RESULTS WITH RECALL SCORES FOR GROUP DIFFERENCES USING PRETESTS AS COVARIATES.

Source of Variation	Sum of Squares	df	Mean Square	f Value	Sig F
PICAC Overall Cov.	681350.34	1	681350.34	65.27	.00
Main Effect Group	11572.30	1	11572.30	1.11	.30
PICAC Auditory Cov.	538357.44	1	538357.44	46.04	.000
Main Effect Group	83252.99	1	83252.99	7.12	.01
PICAC Verbal Cov.	341044.53	1	341044.53	26.07	.00
Main Effect Group	201268.95	1	201268.95	15.38	.00
Story Ref.% C.Sent.	714173.95	1	714173.95	72.94	.00
Main Effect Group	15815.51	1	15815.51	1.61	.21
Story Ref.# C.Sent.	372886.16	1	372886.16	31.41	.00
Main Effect Group	238402.97	1	238402.97	20.08	.00

TABLE 4 .ANCOVA RESULTS FOR QUESTION ANSWERS USING GROUP PRETESTS AS COVARIATES.

Source of Variation	Sum of Squares	df	Mean Square	F Value	sig. F
PICAC O Cov.	62551.27	1	62551.27	122.37	.000
Effect Group	5284.40	1	5284.40	10.34	.002
PICAC A Cov.	55220.37	1	55220.37	105,26	.000
Effect Group	11851.51	1	11851.51	22.59	.000
PICAC V Cov.	38656.41	1	38656.41	61.84	.00
Effect Group	22687.42	1	22687.42	36.29	.00
Story Ref.%	69734.51	1	69734.51	173.33	.00
Effect Group	4332.67	1	4332.67	10.78	.00
Story Ref.#	33704.43	1	33704.43	59.73	.00
Effect Group	31103.46	1	31103.46	55.12	.00

To further examine apparent differences in students performance on the free recall and question response measures, comprehension scores were analyzed in a 6 (discourse type) x 2 (grammatical form) x 2 (ability group) multivariate Analysis of Variance. Scores were calculated for both free recall and question responses; these scores were entered as the dependent measures. Within subjects factors were discourse type (cause effect, narrative, problem solution, descriptive, list like and compare contrast),and grammatical form (simple or complex) and between factors were group (Learning Disabled or Regular Education). The statistical procedure involved two steps. The first stage consisted of an examination of the multivariate F's with free recall responses and question responses each considered separately. If the multivariate F was significant, univariate tests were examined. A summary of these results is presented in Tables 4 and 5.

The analyses from measure three will be reported by factor effects. The results will be given first for discourse type, followed by grammatical form with group differences reported in each.

Discourse Type:

In the multivariate analysis a significant three-factor interaction was found involving discourse type, grammatical complexity and group. I broke that interaction down by testing the main effect of group in each cell of the factorial combination of discourse type and grammatical complexity. Significant effects were found for the cause effect simple, $F(1,58) = 88.58$ $p < .01$, cause effect complex, $F(1,58) = 21.89$ $p < .001$, narrative simple $F(1,58) = 92.61$ $p < .01$, narrative complex $F(1,58) = 54.23$ $p < .01$, problem solution simple $F(1,58) = 39.96$ $p < .001$, problem solution complex $F(1,58) = 40.41$ $p < .001$ passages. Differences for the recall scores for the

Table 4.. Means for Recall Scores (Multivariate Analysis of Group by Grammatical Form, by Discourse Type).

Factor/Level of Factor	Ability Comparison LD	RE
Discourse Type: Cause Effect		
Simple	5.80	23.30***
Complex	4.67	25.03**
Discourse Type: Narrative		
Simple	16.07	48.67***
Complex	16.80	43.40***
Discourse Type: Problem Solution		
Simple	4.80	18.10***
Complex	4.17	17.73***
Discourse Type: Descriptive		
Simple	4.87	19.07
Complex	4.63	17.20
Discourse Type: List Like		
Simple	4.87	15.53
Complex	3.93	14.90
Discourse Type: Compare Contrast		
Simple	3.97	16.80
Complex	3.47	17.50

*** = Significance at the .001 level
** = Significance at the .01 level
* = Significance at the .05 level

Table 5. Means for Responses to Questions for Group by Discourse Type by Grammatical Form

Factor/Level of Factor	Ability Comparison LD	RE
Cause Effect		
Simple	2.67	8.57***
Complex	2.20	8.30*
Narrative		
Simple	5.13	11.10
Complex	5.03	10.83
Problem Solution		
Simple	3.83	8.70**
Complex	3.57	8.90
Descriptive		
Simple	2.63	6.67
Complex	2.70	7.27
List Like		
Simple	2.83	8.43
Complex	2.83	8.67
Compare Contrast		
Simple	3.40	8.00
Complex	2.53	7.50

***= Significance at.001 Level
** = Significance at .01 Level
* = Significance at .05 Level

other passages did not reach significance. These differences for the interaction effect were compared to probed recall results. Similar findings were present as significant effects were found for cause effect simple, F (1,58)= 93.15 p .001, cause effect complex F (1,58) = 4.40 p .04, and problem solution simple F (1,58)= 8.14 p .01 passages. As with recall scores significant effects were not found for the descriptive, list like and compare contrast passages. With the probed responses, however, significant effects were also not found for narrative or the problem solution complex passages. Because these differences had concerned the three-way interaction of group by discourse type, by grammatical form, differences were further explored for the two way interaction of group by discourse type. Significant effects were found for all discourse types (p .001) for both dependent measures, as shown in tables 6 and 7.

Table 6. ANOVA Mean Scores for Recall Responses, Group by Discourse Type.

Factor/Level of Factor	Ability Comparison	
	LD	RE
Cause Effect	10.47	48.33***
Narrative	32.87	92.07***
Problem Solution	8.97	35.83***
Descriptive	9.50	36.27***
List Like	8.80	30.43***
Compare Contrast	7.43	34.30***

Table 7. Mean Scores for Question Answers Group by Discourse Type

Factor/Level of Factor	Ability Comparison	
	LD	RE
Cause Effect	4.87	16.87***
Narrative	10.17	21.93***
Problem Solution	7.40	17.60***
Descriptive	5.33	13.93***
List Like	5.67	17.10***
Compare Contrast	5.93	15.50***

*** = Level of Significance at .00

Grammatical Form:

Because a significant effect was found for grammatical form in the interaction of group by grammatical form by discourse type (F, 5,54= 6.78 p .001) these results were further explored by means of a two way interaction to compare group by grammatical form for the two dependent measures. Although there were significant differences between the Learning Disabled and the Regular Education groups, F, (1,58)= 17.51, p .001, grammatical form F (1,58)= .47 p .49 and the interaction of group by grammatical form F (1,58)= 1.11 p .30, did not reach a level of significance.

Type of Question

Type of question (textually explicit, textually implicit and scriptally implicit) was used as an independent variable in a multivariate analysis with the factors of group and discourse type. Because the sample size of 60 was not sufficient to measure a four way interaction with the added levels of grammatical form (Kirk, 1983), and because significant results were not found for grammatical form outside of group differences, the factor of grammatical form to measure the effect of simple or complex passages was deleted from this analysis. Significant results were found in the multivariate analysis for the interaction with type of question F (5,54)= 3.39 p .01. These findings were further explored by independent analyses of the factor of question type. Table 8 gives the results of the interaction, with all of the discourse types reaching significance with some of the question types with the exception of the problem solution passages. Similar findings were present when group differences were removed.

Table 8 , Results of Multivariate Analysis for Group by Discourse Type, by Type of Question.

Source of Variation	Sum of Squares	df	Mean Square	F Level	Sig. of F
Cause Effect					
T.E.	3367.27	1	3367.27	93.15	.01
T.I.	14.80	1	14.80	4.40	.04
S.I.	3.22	1	3.22	.80	.37
Narrative					
T.E.	3.11	1	3.11	1.39	.24
T.I.	20.85	1	20.85	8.14	.01
S.I.	4.22	1	4.22	2.72	.10
Problem Solution					
T.E.	.07	1	.07	.02	.83
T.I.	.01	1	.01	.01	.93
S.I.	1.84	1	1.84	1.43	.24
Descriptive					
T.E.	.73	1	.73	.37	.55
T.I.	.01	1	.01	.01	.93
S.I.	7.47	1	7.47	4.23	.04
List Like					
T.E.	.22	1	.22	.16	.69
T.I.	7.33	1	7.33	5.40	.02
S.I.	.88	1	.88	.54	.46
Compare Contrast					
T.E.	24.27	1	24.27	12.95	.001
T.I.	.27	1	.27	.18	.67
S.I.	1.49	1	1.49	1.22	.27

DISCUSSION

The results of the findings will be presented according to the research questions. The first research question involved the influence of discourse type on reading comprehension in the two groups of students. The results of the significant differences for structured discourse type clearly support the influence of discourse type on passage comprehension. Significant differences were found for the discourse types of cause effect, narrative and problem solution when compared to descriptive, list like and compare contrast passages. These differences were maintained when the factor of group was taken out of the analysis. Differences were present for both free and probed recall responses.

In analyzing the six passages, although they each represent a distinct form of discourse type, the nature of the first three passage types results in a stronger structure for both syntactic form and content organization. Consider, for example the temporal order of reasons-results, episode sequence and question-answer frames available to the reader in interpreting the first three passage types. In all three passage structures the information introduced basically follows an order of mention sequence. The reader is able to use the passage order to organize the information in the order in which it is introduced in each sentence.

In contrast, structures such as descriptive (with an elaboration of ideas central to a specific topic) list like (with an equal weighting for a series of items) and compare contrast (in which the reader must recategorize concepts in his or her mind to place the information with the appropriate referent) do not lend themselves to the same level of idea organization. These passages rather require retention of descriptive terms, discrete facts of an episodic nature, or retention of the categories to place the

concepts in to for comparison. None of these types allow for sequential order in encoding the information. The higher mean scores on the structured passages supports the findings of researchers who have stressed the importance of text structure in facilitating learning (Armbruster, 1984; Meyer, 1979; Shimmerlik, 1978). In particular, results support Frederiksen's (1975) conclusions that readers may alter the manner in which they process discourse, with the most use of conventional text based structures for highly conventionalized texts, and the least use for freely varying texts. In such a case, the more conventionalized, controlled text base structure of certain discourse types would facilitate reader processing.

The second portion of the first research question concerned the role of grammatical form in influencing text comprehension. Results indicated that, although group differences were found, there was no support for the premise that altering grammatical form would influence comprehension for text material in either population. The failure to find differences based on grammatical form concurs with the results of Tierney and Mosenthal (1981), and Freebody and Anderson (1981) for skilled readers.

Because the subjects in this study had syntactic deficits, and previous researchers stated the importance of processing linguistic connectives to understand causal relationships (Katz & Brent, 1968; Pearson, 1974-75), an analysis of their response to changes in sentence structure was important in further delineating both the role of syntactic skills in text comprehension and the possible implications for remediation.

The first research question also concerned the differences between the Learning Disabled students' and the Regular Education students' responses to both types of text manipulations. Findings on the two groups for discourse type manipulations concur with Taylor (1980), Meyer, Brandt and Bluth (1980), and Brown and Smiley (1977, 78), who reported that good and poor readers differ in their ability to recall and distinguish important ideas form text. the poor responses of the Learning Disabled students when compared to their age matched peers, concurs with the findings of Bransford, Stein, Nye, Franks, Auble, Merynski & Perfetto (1982) that poor readers do not routinely and spontaneously form a coherent representation by drawing concise, integrated inferences. When the groups were compared although more ideas were recalled from structured discourse types in both groups, the Learning Disabled readers scored significantly lower than the Regular Education students in their ability to recall important ideas and to draw inferences from all types of text material.

Findings did not support the role of grammatical form for simple and complex sentence structures in facilitating recall in either group. The failure to find significant results for the surface level changes in grammatical form suggests that syntactic skills necessary to link ideas together across a series of sentences (felt to be involved in integration of text material) may be at a higher level and therefore not activated, not available or not facilitated by changes in surface structure form at the isolated sentence level. This would suggest that a certain level of syntactic knowledge is needed for text integration and that changes in surface structure form do not influence the sentence integration process. They will influence the comprehension across individual sentences but not the comprehension across sentences once these sentences have been comprehended.

Similar findings for both groups were present for the role of cues in facilitating responses to varied types of comprehension questions. An analysis of the means indicates that the question types were responded to differently, also at a significant level, with both groups achieving higher scores for textually explicit questions. Such findings support the need to link sentences together across text at a syntactic level to draw the inferences needed to respond to textually implicit questions. Textually explicit questions may be easier because they require retention of facts stated completely within one sentence context.

The second research question concerned the relationship of language skills to reading comprehension in children who are good decoders and poor comprehenders. The findings from the pretest group comparisons support the presence of language learning problems in the Learning Disabled group of children. Results of the Analysis of Covariance suggest that their particular weaknesses are due to syntactic deficits, because the Overall PICAC scores and the percent of complex sentences used accounted for the group differences. The findings of difficulty in syntactic areas for the Learning Disabled students with low comprehension are in agreement with Oakhill (1982) who reported superficial representations of meanings from sentences in fifth graders who were poor comprehenders.

In summary, the Learning Disabled and the Regular Education students were able to respond significantly better to text passages containing clear author structure, as indicated by their higher mean scores on the discourse types of cause effect, narrative, and problem solution. Although the Learning Disabled students consistently scored at a lower level on all discourse types, their patterns of response were similar to those of the Regular Education students.

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